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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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What Price Crop Insurance? An Environmental Analysis From China

EEPSEA POLICY BRIEF • No. 2006-PB7

Across the developing world, governments are grappling with the challenge of how best to support small-scale farmers in ways that do not damage the environment. A new study from China – where the problem is particularly acute – has found that government subsidies for crop insurance are a potential solution. According to the study, such subsidies help protect farmers from→

A summary of EEPSEA Research Report 2006-RR7, Crop Insurance and Agrochemical Use in the Manasi Watershed, Xinjiang, China, by Funing Zhong, Manxiu Ning, Li Xing, College of Economics and Management, Nanjing Agricultural University, Nanjing 210095 China. Tel: 86-25-84395735. E-mail: fnzhong@njau.edu.cn

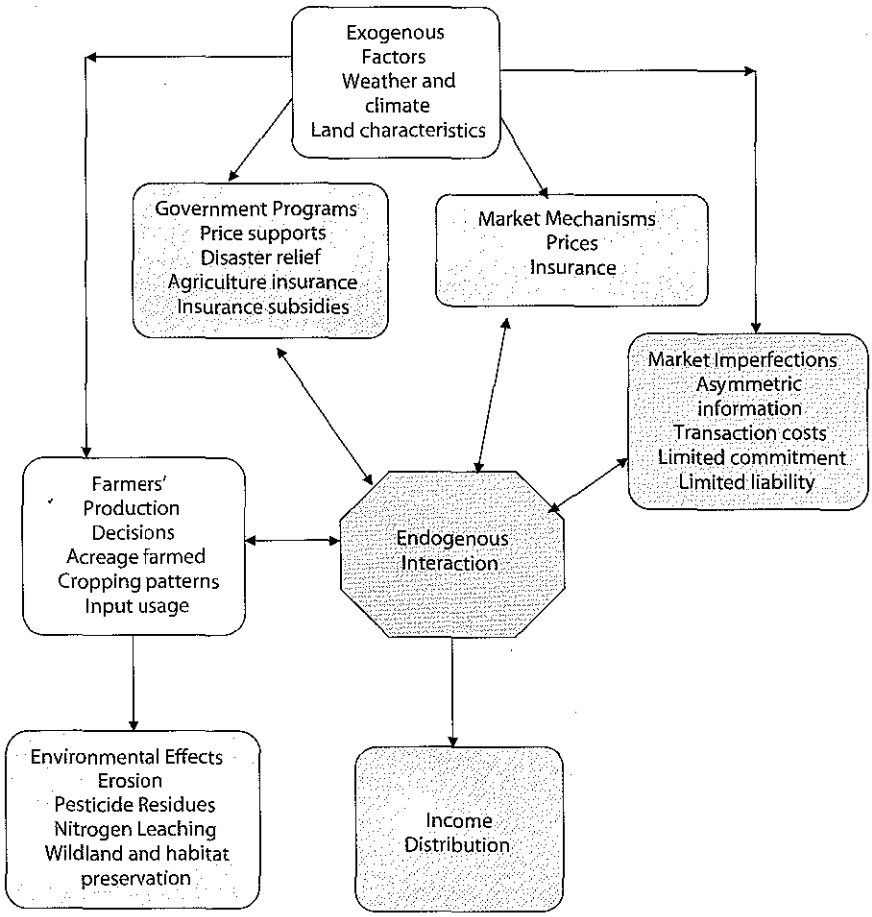
"Subsidies help protect farmers ...

the economic impact of crop failures and reduce the amount of pesticides they use. In addition, this approach is in line with the guidelines of the World Trade Organization (WTO), of which China is now a member.

The study was carried out by a team of researchers led by Funing Zhong, from the College of Economics and Management at Nanjing Agricultural University. The team collected data on the main agro-chemical inputs used by farmers growing cotton in the province of Xinjiang. By assessing how the use of these inputs are related to farmers' decisions regarding crop insurance, the researchers were able to predict the potential environmental impact of government subsidies. They concluded that a government-subsidized crop insurance program is an acceptable policy initiative that will have a minimal negative impact on the environment.

China's Agricultural Challenge

China has to feed 22% of the world's population, yet it only has 7% of the world's land. Many Chinese farmers work on poor land and face low and unstable yields and incomes. Further pressure on farm prices has followed China's integration into the world market and this has made farmers lives even more difficult. In response, policy makers, economists and environmentalists are looking for ways to protect farmers' incomes. Given the fragile nature of much of China's farmland, it is vital that the solutions be environmentally sustainable. Because it is now a member of the WTO, China must also find mechanisms that are in line with this organization's rules.



Interaction between Crop Insurance, Farmers' Production Decisions and the Environment

Among the ideas that have been suggested are government subsidies to expand the coverage of crop insurance schemes. Crop insurance programs can help provide more stable incomes to farmers through indemnity payments (compensation) for crop failures. However, there is a fear that crop insurance programs can increase agrochemical use and change cropping patterns – and so have a negative impact on the environment. This is a particularly important issue in China, where the increasing use of agricultural chemicals has caused serious environmental degradation.

Crop Insurance In Action

To assess the environmental impact of crop insurance programs, Zhong's team looked at the relationship between crop insurance and agro-input use in the Manasi Watershed region of Xinjiang Province. Although some other provinces have begun to offer their own crop insurance programs, Xinjiang is the only one that has provided crop insurance programs for a significant period of time – in its case, almost twenty years. Indeed, participation in the province's insurance program has increased significantly in recent years and the scheme is well understood and popular. The crop insurance policies in the area are "low-indemnity, low-premium". A farmer who participates in an insurance program for cotton is

and reduce pesticide use"

entitled to receive an indemnity only if the actual yield is below 50% of the normal level, and the indemnity is no more than 40% of the production costs incurred. Because the indemnity is low, the premium is low – a farmer needs to pay only about USD 37 per hectare.

Xinjiang is the largest inland province in northwest China, but it has limited natural resources and harsh conditions for agricultural production. Despite this, it is one of the most important cotton-producing areas in China. Because of the unforgiving nature of the environment, cotton growers in the province rely heavily on chemical fertilizers and other agro-chemicals. The three main agro-chemical inputs used by cotton growers in Xinjiang are fertilizers, pesticides and agro-film. Agro-film is a very thin sheet used to protect soil moisture and raise soil temperature. It is used extensively in Xinjiang because of the extreme climate. Its main environmental impact is its tendency to break up into small pieces that accumulate in the soil. Overall, the high reliance on agro-chemical inputs in the region has led to significant environmental problems including soil and water contamination. These factors make Xinjiang an ideal place to assess the negative environmental impacts of crop insurance programs: If crop insurance benefits farmers in this region without damaging the environment, it is quite likely to do the same in other regions of China.

Is Crop Insurance Environmentally Friendly?

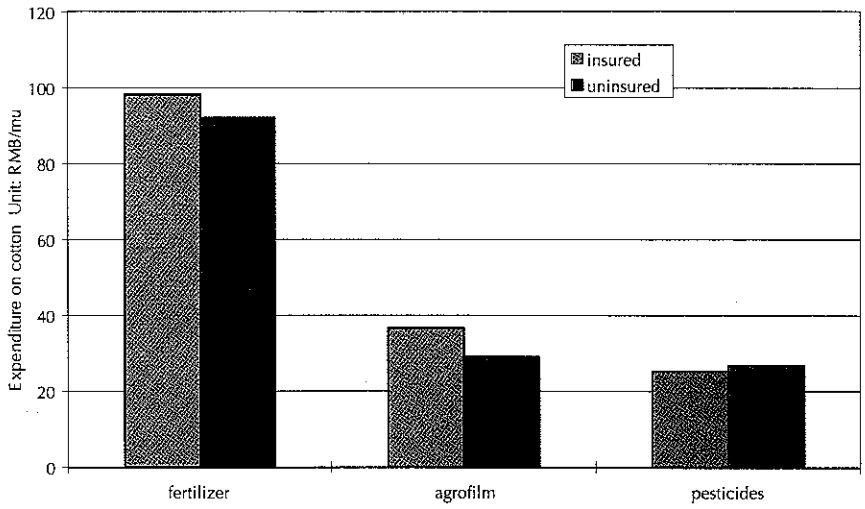
The links between a farmer's decision to use agro-chemical inputs and to buy agricultural insurance are complex and are influenced by a variety of external factors, from the weather to changes in the market for farm products. Zhong's team undertook a series of economic assessments to try and capture the complexity of this relationship and to investigate the most significant factors involved. The data used in this assessment came from primary and secondary sources. The primary data were collected from a sample of farm households. Four hundred and fifty cotton farmers were randomly selected from the study area and 340 effective samples were used in the study. Information was collected on a variety of issues. This included information on crops (including yields and income), information on production costs (especially relating to the use of fertilizers, pesticides and agro-film) and a variety of socio-economic details. Secondary data came from official statistical publications and literature published in China. Information was gathered on agricultural production, utilization of agrochemical inputs, the current environmental situation and agriculture insurance programs at various administrative levels.

The results of this study indicate that a farmer's decision to purchase crop insurance depends on how he or she uses artificial inputs: those who apply more chemical fertilizers and agro-film are more likely to participate in crop insurance programs while those who apply more pesticides are less likely to do so. Farmers' agro-input decisions are influenced by the decision to purchase crop insurance: if cotton production is insured, pesticides are less likely to be applied, while agro-film and chemical fertilizers are likely to be applied in larger amounts, though in the case of fertilizers the difference is not statistically significant.

Overall, the findings indicate that, on average, farmers with insurance apply about 20% more agro-film and 3% more fertilizer than those farmers who do not have crop insurance. At the same time, the farmers with insurance tend to apply 19% less pesticide than farmers on uninsured farms.

The Impact Of Subsidies

These findings can be explained by the fact that pesticides reduce the risk that crops face from insects, so farms that use them have less need for insurance.



Difference in Agrochemical Inputs between Insured and Uninsured Farmers

Source: Calculated by authors

Conversely, fertilizers and agro-film increase the risk that crops face – they both make crops more exuberant and vulnerable to unfavorable, unexpected natural conditions. In addition, the current insurance scheme is low indemnity, and therefore provides little incentive for farmers to risk crop failure by increasing the application of agro-inputs. This explains why the use of these different technologies influence farmers' decisions to purchase crop insurance in different ways.

These findings were used to estimate the impact of a government subsidy scheme. In 2003 the percentage of farmers with crop insurance was 45% (this was without a premium subsidy). Based on the assumption that the amount of land used to grow cotton would remain the same, the impact of a 10% premium subsidy was calculated. It was found that the participation rate would go up to 83%. It was also estimated that total pesticide application would likely go down by about 2%, while the total application of agro-film would increase by 9%. Under such a scheme, the amount of fertilizer used by cotton farmers in Xinjiang is likely to increase by 2.5%.

A Policy Plus

This indicates that a government-subsidized crop insurance program would be an acceptable policy alternative. Under the current low-premium, low-indemnity policy, a crop insurance program is not likely to induce major increases in agro-input use and that the only significant environment impact would be a small increase in the accumulation of small pieces of broken agro-film in the soil.

There are a number of other factors that favour a government subsidy for crop insurance programs. Because there is little arable land available in China, crop insurance is not likely to encourage the expansion of crop production into new land. The proposed government subsidy is also not likely to induce a shift in production from crops requiring few agro-inputs to cotton with its high chemical input costs.

Nevertheless, it is clear that the introduction of subsidies would have to be coupled with policies to counter the potential environmental impact of increased agro-film use. The subsidy program would be best applied to areas where agro-film is not a necessary input. At the same time, the development of easy-pickup agro-film and cost-effective equipment to clear the soil should be encouraged.

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